

SHERLOC INVESTIGATION AT THE MÁÁZ AND SÉÍTÁH FORMATIONS WITHIN JEZERO CRATER

L. W. Beegle¹, R. Bhartia², L. DeFlores¹, W. Abbey¹, S. Asher³, E. Berger⁵, S. Bykov³, A. Burton⁴, E. Cardarelli¹, A. D. Czaja¹⁸, A. Fox⁴, M. Fries⁴, P. Conrad⁷, S. Clegg⁸, K. S. Edgett⁹, B. Ehlmann¹⁰, L. Kah¹¹, C. Lee⁴, M. Minitti¹³, A. E. Murphy¹², J. Razzell Hollis¹, R. Roppel³, E. L. Scheller¹⁰, S. Sharma¹, S. Siljeström¹⁴, C. Smith¹⁵, P. Sobron¹⁶, A. Steele⁷, R. Wiens⁸, K. Williford¹, B. Wogsland⁹, M. R. Kennedy⁹, A. Yanchilina¹⁷, R. A. Yingst¹², and the SHERLOC team. ¹Jet Propulsion Laboratory, California Institute of Technology, Pasadena CA, 91109 (Luther.Beegle@jpl.nasa.gov), ²Photon Systems Inc., ³University of Pittsburgh, ⁴Johnson Space Center, ⁵Texas State University – Jacobs JETS – NASA Johnson Space Center ⁷Carnegie Institute Washington, ⁸Los Alamos National Laboratory, ⁹Malin Space Science Systems, ¹⁰California Institute of Technology, ¹¹University of Tennessee-Knoxville, ¹²Planetary Science Institute, ¹³Framework, ¹⁴RISE Research Institutes of Sweden, Stockholm, Sweden, ¹⁵Natural History Museum, London, ¹⁶SETI Institute, ¹⁷Impossible Sensing LLC, ¹⁸University of Cincinnati, Department of Geology, Cincinnati, OH 45221-0013

Introduction: The Scanning Habitable Environments with Raman and Luminescence for Organics and Chemicals (SHERLOC) instrument combines microscopic imaging, native fluorescence and Raman spectroscopy to better understand the mineral and chemical makeup of rocks on the martian surface. Native fluorescence emissions from aromatic organic species allow for detection and classification of aromatic organic molecules, whereas Raman scattered photons from molecules allow identification of functional groups of organics, chemicals, and minerals. These signatures are obtained on a 100 micron spatial scale and collocated to images so textures, minerals and chemicals can all be compared [1].

Results: SHERLOC has been operating on Mars since February 18, 2021. As of this writing, we have analyzed 3 natural surfaces, and 5 abraded rock patches created during the Crater Floor Campaign within Jezero crater [2].

The Guillaumes target (from the Roubion outcrop, Roubion member of the Mááz Formation) is dominated by Ca-sulfate with patches of perchlorate.

The Bellegarde target (from the Rochette outcrop, Rochette member of the Mááz Formation) exhibits Raman peaks that match hydrated Ca-sulfate, amorphous/microcrystalline silicate (AMS), carbonate, and phosphate phases. A fluorescence doublet at ~305 and ~325 nm was detected and is most likely due to indigenous organic material in the sample.

The Garde target (from the Bastide outcrop, Bastide member of the Séítah Formation) is dominated by olivine and carbonate with AMS occurring across the material.

The Dourbes target (from the Brac outcrop, Bastide member of the Séítah Formation) is dominated by olivine and shows minor amounts of carbonate, hydrated Ca-sulfate, and AMS.

The Quartier target exhibits a large sulfate feature, as well as carbonate, perchlorate, olivine and a fluorescence doublet at 305 and 325 nm and is very similar to that observed at Bellegarde.

In each of these samples we have identified fluorescence features that are likely aromatic organics native to the rock interiors.

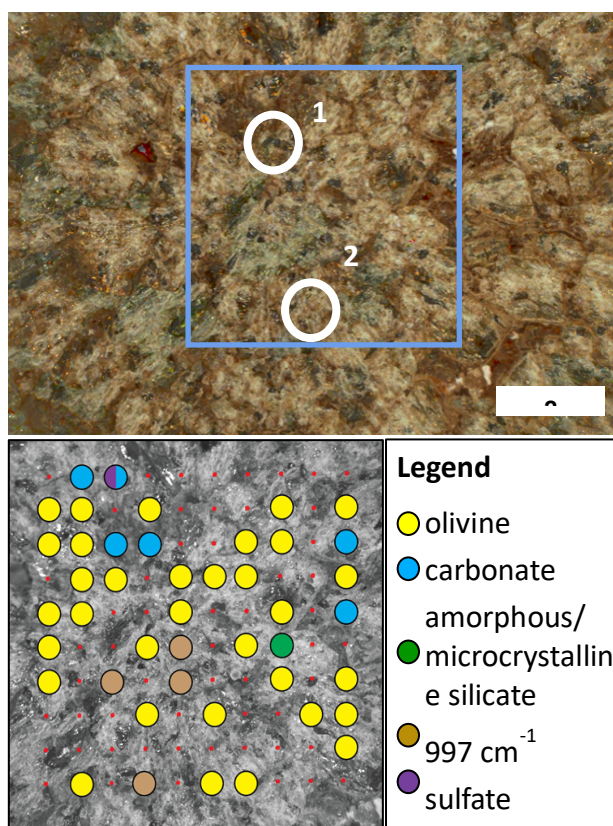


Fig. 1 TOP: WATSON image of abraded Dourbes target taken on Sol 257. Blue box denotes analyzed area. Points 1 and 2 mark areas with fluorescence features consistent with organics. BOTTOM: ACI image marked with preliminary mineral identifications.

Acknowledgments: This work was carried out at the Jet Propulsion Laboratory, The California Institute of Technology under a contract from NASA.

References: [1] Bhartia, R. et al. (2021) *Space Sci. Rev.*, 217, 58 [2] Farley et al. (2022) submitted to Science; Scheller et al. (2022) submitted to Science.